Center for Operational Oceanographic Products and Services
Information Systems Division

Year 2000 Compliancy

Critical System Test Plans: Tide and Current Predictions

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noaa **National Oceanic And Atmospheric Administration**

U.S. DEPARTMENT OF COMMERCE
National Ocean Service
Center for Operational Oceanographic Products and Services
1.1 Tide and Current Predictions

Summary:

- In their presently used form, none of the software had problems handling or manipulating dates and time. All software is deemed compliant with Y2K requirements.

- Personal computing workstations are used to compute the predictions**.** See "Year 2000 Compliancy: Critical System Test Plans: Personal Computers" for a description of PC compliancy issues.

1.1.1 Software and Firmware Compliancy

1.1.1.1 Commercial Off the Shelf (COTS) Application Software

No COTS packages are used in generating tide and current predictions**.**

1.1.1.2 Operating Systems and BIOS

All tide and current predictions are calculated, stored and subsequently disseminated using Personal Computing platforms. See "Year 2000 Compliancy: Critical System Test Plans: Personal Computers" for a description of PC compliancy issues.

1.1.1.3 In-House Written Software

All programs that manipulate dates recognize that the year 2000 is a leap year and that the other century years are not leap years.
Some programs that are designed to run only in real-time applications treat all century years as leap years (this makes them good until 2100). If they use a two digit year, the assumption is that any year greater than 90 is 19xx and years less than 90 are 20xx. All programs that use Julian dates use exactly the same source code for subroutines across all platforms (PC DOS, Unix, Windows).

The only problem encountered was that the external data formats for tides and tidal currents used only a two digit year. The tide and current prediction programs have no internal calculation problems associated with Y2K except that the data output was only a two digit year field. The same applied to all the dependent programs that manipulate the data once it is read in. In all cases, the changes involved simply reading and writing a four digit year instead of two digit, and removing code that added 1900 to the two digit year (or adding code to remove the century field).

Personnel in the Products and Services Division have designed a new tide and current prediction data format that uses a four digit year. All dependent programs have been modified have been modified to use this new format. This was a relatively

straightforward task.

The only subroutine that is date dependent is YRDATA, which calculates tidal equilibrium arguments. *This subroutine has been used for the past 10 years with no problems, including being used for predictions beyond the year 2000 and before 1900.* In addition, YRDATA has been internally verified that is correctly computes which years are leap years. All programs that compute dates recognize that the year 2000 is a leap year.

C **Testing the prediction of tidal heights through 2000**

Examining a sequence of predicted tidal heights, there should be a smooth change from one value to the next and across dates. Using six minute tide predictions for New York, December 31, 1999 and January 1, 2000, as well as February 29, 2000 to March 1, 2000 it is shown that the tides change smoothly across each date boundary.

Looking at hour 23, of December 31, 1999, the last four values are 0.97, 1.06, 1.16, and 1.26.

Going into January 1, 2000, the first four values are 1.34, 1.44, 1.55, and 1.65. The difference from one value to the next is a consistent with what is expected.

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      851-8750 New York, New York   T.M. 75 W.  *** Used 1994 ->  ***
      Predicted 6 minute heights     December 31, 1999      Datum  2.580
      *NOAA, National Ocean Service*


                                          minutes into the hour
      Hour       0       6      12      18      24      30      36      42      48
54

        20    1.28    1.21    1.14    1.07    0.99    0.92    0.85    0.77    0.70
0.63
        21    0.56    0.50    0.44    0.38    0.33    0.28    0.24    0.20    0.18
0.16
        22    0.14    0.14    0.15    0.16    0.18    0.21    0.25    0.29    0.34
0.40
        23    0.47    0.54    0.62    0.70    0.78    0.87    0.97    1.06    1.16
1.26
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851-8750 New York, New York T.M. 75 W. *** Used 1994 -> ***
Predicted 6 minute heights January 1, 2000 Datum 2.580
NOAA, National Ocean Service

	minutes into the hour								
Hour	0	6	12	18	24	30	36	42	48	54
0	1.34	1.44	1.55	1.65	1.75	1.85	1.95	2.05	2.15	2.25
1	2.35	2.44	2.54	2.63	2.72	2.81	2.90	2.99	3.08	3.16
2	3.25	3.33	3.41	3.49	3.56	3.64	3.71	3.78	3.84	3.91
3	3.97	4.02	4.08	4.13	4.18	4.22	4.26	4.29	4.32	4.35
4	4.37	4.38	4.39	4.40	4.40	4.39	4.38	4.36	4.33	4.31

Looking at hour 23, of February 28, 2000, the last four values are 1.13, 1.20, 1.27, and 1.35.

Going into March 1, 2000, the first four values are 1.43, 1.51, 1.60, and 1.69. The difference from one value to the next is a consistent with what is expected.

851-8750 New York, New York T.M. 75 W. *** Used 1994 -> ***
Predicted 6 minute heights February 29, 2000 Datum 2.580
NOAA, National Ocean Service

	minutes into the hour								
Hour	0	6	12	18	24	30	36	42	48	54
20	1.79	1.74	1.70	1.65	1.61	1.56	1.52	1.47	1.42	1.38
21	1.33	1.28	1.23	1.19	1.14	1.09	1.05	1.01	0.97	0.93
22	0.89	0.86	0.84	0.82	0.80	0.79	0.79	0.79	0.80	0.82
23	0.84	0.88	0.91	0.96	1.01	1.07	1.13	1.20	1.27	1.35

851-8750 New York, New York T.M. 75 W. *** Used 1994 -> ***
Predicted 6 minute heights March 1, 2000 Datum 2.580
NOAA, National Ocean Service

	minutes into the hour								
Hour	0	6	12	18	24	30	36	42	48	54
0	1.43	1.51	1.60	1.69	1.78	1.87	1.95	2.04	2.13	2.22
1	2.31	2.39	2.47	2.55	2.63	2.71	2.78	2.85	2.92	2.99
2	3.06	3.12	3.18	3.24	3.30	3.36	3.41	3.46	3.51	3.56
3	3.61	3.66	3.71	3.75	3.79	3.83	3.87	3.91	3.94	3.98
4	4.01	4.03	4.06	4.08	4.10	4.12	4.13	4.14	4.15	4.15

1.1.2 Hardware Compliancy

All tide and current predictions are calculated, stored and subsequently disseminated using Personal Computing platforms. See “Year 2000 Compliancy: Critical System Test Plans: Personal Computers” for a description of PC compliancy issues.